

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-2, 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walt et al. (US 2002/0172716) in view of Yamamoto et al. ("Surface Interaction Forces of Well Defined, High Density Polymer Brushes Studied by Atomic Force Microscopy. 1. Effect of Chain Length", July, 6, 2000)

3. Regarding claims 1-2 and 5, Walt discloses a core-shell microsphere compositions, hollow polymeric microsphere, where the microsphere are characterized as having a polymeric shell with consistent shell thickness (abstract). Walt also discloses that the hollow polymer microsphere were prepared by coating silica microsphere templates with poly(benzyl meth acrylate) using surface initiated controlled/living radical polymerization (para 0039). The microsphere shell is typically obtained from monomers such as styrene or methacrylate and the shell contains a block polymer resulting from the polymerization of these monomers such as styrene-methacrylate, benzyl methacrylate-PMMA, etc. The strength and the durability of the polymeric shell is

increased by crosslinking polymer chains (para 0011). As seen in Table 4, the polydispersity or PDI or molecular weight distribution index of the polymer is 1.37 and 1.26 at 6.5 hrs and 14 hrs respectively (para 0086). The benzyl methacrylate is the crosslinkable monomer having a crosslinkable functional group (para 0057) located on the innermost portion of the polymer and the PMMA is the non-crosslinkable monomer of the present application, which meets the limitation of claim 3.

4. However, Walt does not expressly mention that the polymer is polymer brush high density polymer and the density of chains is 0.4 to 1.2 chains/nm². Whereas, Yamamoto discloses a polymer brushes comprised of low-polydispersity poly (methyl methacrylate) (PMMA) chains densely end grafted on a silicon substrate by living radical polymerization; these brushes are characterized by an exceptionally high nearly constant graft density approximately 0.4 chains/nm² and wide range of molecular weight of the graft chains (abstract). The presence of PMMA makes the density high and density of chains composing the polymer brush layer is 0.4 chains/nm² as taught by Yamamoto. The motivation of having the density of chains composing the polymer brush layer such as PMMA of 0.4 chains/nm² is to have strong resistance against compression with an extremely high graft density (conclusion, last 3 lines).

5. In light of the motivation of using the polymer brush layer with a density of chains of 0.4 chains/nm² as taught by Yamamoto as described above, it therefore would have been obvious to one of ordinary skill in the art at the time of invention to use the polymer brush layer with such density, include benzyl methacrylate-PMMA, in Walt in order to produce hollow nanoparticle having strong resistance to compression.

6. Regarding claim 7, Walt discloses that the hollow microsphere is prepared by providing a microsphere substrate contacting the microsphere substrate with a polymer nanosphere to yield a colloidal assembly heating the assembly to yield a core-shell composite, the microsphere is 3-10 micrometer in diameter and the nanosphere is 100-200 nm (para 0015-0016), which would be less than 5 micrometer as required by claim 7.

7 Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Walt et al. (US 2002/0172716) in view of Yamamoto et al. ("Surface Interaction Forces of Well Defined, High Density Polymer Brushes Studied by Atomic Force Microscopy. 1. Effect of Chain Length", July, 6, 2000) and further in view of Watanabe et al. (US 2005/0113505).

8. Regarding claim 6, Walt discloses core-shell microsphere compositions as set forth above, However; regarding claim 6, Walt in view of Yamamoto does not expressly mention that the degree of polymerization of the crosslinkable monomer is from 10 to 10000 and the degree of polymerization of the non-

crosslinkable monomer block is 10 to 10000. However, Watanabe discloses seed particles which are used in the production of hollow polymer particles (para 0029) and the polymer having a weight average molecular weight of preferably 1000 to 10,000 (para 0031), wherein the polymerizable monomer composition absorbed in seed particles contains a crosslinkable monomer component and a hydrophilic monomer (abstract), the degree of polymerization is same average molecular weight, which meets the limitation of claim 6. Watanabe also discloses that the molecular weight of the polymer can be controlled by the amount of specific chain transfer agent and other chain transfer agents used in the emulsion polymerization reaction (para 0031). The motivation of having the degree of polymerization in the range of 1000 to 10000 is if it exceeds 15,000 the stability of the reaction system in the emulsion polymerization reaction becomes poor and a coagulated product occurs (para 0032) and if it is lower than 500 it is low in ability to absorb the crosslinkable polymerizable monomer composition (para 0033).

9. In light of the motivation of having the average molecular weight of the crosslinkable monomer and non-crosslinkable monomer between 1000 to 10000 as taught by Watanabe, as described above, it therefore would have been obvious to one of ordinary skill in the art at the time of invention to have the average molecular weight between 1000 and 1000 to prevent to lower the stability of the reaction system in the emulsion polymerization reaction to become

poor and a coagulated product occurs (para 0032) and to absorb the crosslinkable polymerizable monomer composition (para 0033).

10. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Walt et al. (US 2002/0172716), Yamamoto et al. ("Surface Interaction Forces of Well Defined, High Density Polymer Brushes Studied by Atomic Force Microscopy. 1. Effect of Chain Length", July, 6, 2000) and Maruyama et al. (US 2002/0016418)

11. Regarding claim 8, Walt discloses a core-shell microsphere compositions, hollow polymeric microsphere, where the microsphere are characterized as having a polymeric shell with consistent shell thickness (abstract). Walt also discloses that the hollow polymer microsphere were prepared by coating silica microsphere templates with poly (benzyl meth acrylate) using surface initiated controlled/living radical polymerization (para 0039). The microsphere shell typical contains styrene, methacrylate and the shell contains a polymer resulting from the polymerization of one or more monomers selected from styrene-methacrylate, benzyl methacrylate-PMMA, poly methyl methacrylate (PMAA) would be a non-crosslinkable monomer and would correspond to formula 56 of claim 8. The strength and the durability of the polymeric shell is increased by crosslinking polymer chains (para 0011). The benzyl methacrylate will be the crosslinkable monomer having a crosslinkable functional group located on the innermost of the polymer brush layer and the PMMA will be non-crosslinkable

monomer of the present application, which meets the limitation of claim 3.

However, Walt does not expressly mention that the polymer is high density polymer brush layer and the crosslinkable functional group represent by the formula 54 or 55. Whereas, Yamamoto discloses a polymer brushes comprised of low-polydispersity poly (methyl methacrylate) (PMMA) chains densely end grafted on a silicon substrate by living radical polymerization, these brushes are characterized by an exceptionally high nearly constant graft density approximately 0.4 chains/nm^2 and wide range of molecular weight of the graft chains (abstract). The presence of PMMA makes the density high and density of chains composing the polymer brush layer is 0.4 chains/nm^2 as taught by Yamamoto. Maruyama discloses a coating composition curable by actinic radiation or heat or both comprising a polymer containing an alkoxysilyl group, a cationic polymerization initiator and cationic reactivity compound (abstract), Maruyama also discloses a polymerizable monomers include those having a cationic reaction functional group such as 3-methyl-3-methacryloyloxy methyloxetane (para 0021), Which corresponds to the formulae 53-54 of the present invention.

12. The motivation of using the high density polymer brushes is to have strong resistance against compression with an extremely high graft density (conclusion, last 3 lines) and motivation of using the crosslinkable functional group such as 3-methyl-3-methacryloyloxy methyloxetane in the coating composition is to form a

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curable coating composition that has desirable characteristics including low viscosity, good workability, good surface curing properties and can provide a cured film having high hardness (para 0001)

13. In light of the motivation of using the polymer brush layer with a density of chains of 0.4 chains/nm² as taught by Yamamoto and using the crosslinkable functional group such as 3-methyl-3-methacryloyloxy methyloxetane in the coating composition as taught by Maruyama as described above, it therefore would have been obvious to one of ordinary skill in the art at the time of invention to use the polymer brush layer with such density, include benzyl methacrylate-PMMA, in Walt to have strong resistance against compression with an extremely high graft density and using a crosslinkable monomer with a functional group such as 3-methyl-3-methacryloyloxy methyloxetane of Maruyama and replaced with the crosslinkable functional group such as benzyl-methacrylate of Walt to form a curable coating composition that has desirable characteristics including low viscosity, good workability, good surface curing properties and can provide a cured film having high hardness (para 0001)

14. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Walt et al. (US 2002/0172716), Yamamoto et al. ("Surface Interaction Forces of Well Defined, High Density Polymer Brushes Studied by Atomic Force Microscopy. 1. Effect of Chain Length", July, 6, 2000) and Sato et al. ("Radical and Cationic Polymerizations of 3-Ethyl-3-methacryloyloxymethyloxetane", 2001)

15. Regarding claim 8, Walt discloses a core-shell microsphere compositions, hollow polymeric microsphere, where the microsphere are characterized as having a polymeric shell with consistent shell thickness (abstract). Walt also discloses that the hollow polymer microsphere were prepared by coating silica microsphere templates with poly (benzyl meth acrylate) using surface initiated controlled/living radical polymerization (para 0039). The microsphere shell typical contains styrene, methacrylate and the shell contains a polymer resulting from the polymerization of one or more monomers selected from styrene-methacrylate, benzyl methacrylate-PMMA, poly methyl methacrylate (PMAA) would be a non-crosslinkable monomer and would correspond to formula 56 of claim 8. The strength and the durability of the polymeric shell is increased by crosslinking polymer chains (para 0011). The benzyl methacrylate will be the crosslinkable monomer having a crosslinkable functional group located on the innermost of the polymer brush layer and the PMMA will be non-crosslinkable monomer of the present application.

16. However, Walt does not expressly mention that the polymer is high density polymer brush layer and the crosslinkable functional group represent by the formula 53, 54 or 55. Whereas, Yamamoto discloses a polymer brushes comprised of low-polydispersity poly (methyl methacrylate) (PMMA) chains densely end grafted on a silicon substrate by living radical polymerization, these brushes are characterized by an exceptionally high nearly constant graft density

approximately 0.4 chains/nm² and wide range of molecular weight of the graft chains (abstract). The presence of PMMA makes the density high and density of chains composing the polymer brush layer is 0.4 chains/nm² as taught by Yamamoto. Sato discloses methacrylate monomers have been prepared and their radical polymerization behaviors have been studied as they show high reactivities of the methacrylate groups in radical polymerization, EMO, a methacrylate monomer carrying an oxetane group is expected to show high polymerizabilities in radical and cationic polymerization (Introduction). The 3-methyl-3-methacryloyloxy methyloxetane (EMO), which corresponds to the formula 53-54 of claim 8. The motivation of using the high density polymer brushes such as PMMA is to have strong resistance against compression with an extremely high graft density (conclusion, last 3 lines) and motivation of using the crosslinkable functional group such as 3-methyl-3-methacryloyloxy methyloxetane is that it has high reactivities and shows high polymerizabilities in radical and cationic polymerization (Introduction)

17. In light of the motivation of using the polymer brush layer with a density of chains of 0.4 chains/nm² as taught by Yamamoto and using the crosslinkable functional group such as 3-methyl-3-methacryloyloxy methyloxetane in the coating composition as taught by Maruyama as described above, it therefore would have been obvious to one of ordinary skill in the art at the time of invention to use the polymer brush layer with such density, include benzyl methacrylate-

PMMA, in Walt to have strong resistance against compression with an extremely high graft density and using a crosslinkable functional group such as 3-methyl-3-methacryloyloxy methyloxetane of Sato and replaced with the crosslinkable functional group such as benzyl-methacrylate of Walt to form a hollow polymer particles that would have high reactivities and high polymerizabilites.

18. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Walt et al. (US 2002/0172716), Yamamoto et al. ("Surface Interaction Forces of Well Defined, High Density Polymer Brushes Studied by Atomic Force Microscopy. 1. Effect of Chain Length", July, 6, 2000), Watanabe et al. (US 2005/0113505) and Dumain (US 2002/0065369).

19. Regarding claim 9, Walt discloses a core-shell microsphere compositions, hollow polymeric microsphere, where the microsphere are characterized as having a polymeric shell with consistent shell thickness (abstract). Walt also discloses that the hollow polymer microsphere were prepared by coating silica microsphere templates with poly (benzyl meth acrylate) using surface initiated controlled/living radical polymerization (para 0039). The microsphere shell typical contains styrene, methacrylate and the shell contains a polymer resulting from the polymerization of one or more monomers selected from styrene-methacrylate, benzyl methacrylate-PMMA, poly methyl methacrylate would be a non-crosslinkable monomer and would correspond to formula 60 of claim9. The strength and the durability of the polymeric shell is increased by crosslinking

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polymer chains (para 0011). The benzyl methacrylate will be the crosslinkable monomer having a crosslinkable functional group located on the innermost of the polymer brush layer and the PMMA will be non-crosslinkable monomer of the present application.

20. However, Walt does not expressly mention that the polymer is high density polymer brush layer and the crosslinkable functional group represent by the formula 57-58 or 59 and a polyfunctional compound as claimed. Whereas, Yamamoto discloses a polymer brushes comprised of low-polydispersity poly (methyl methacrylate) (PMMA) chains densely end grafted on a silicon substrate by living radical polymerization, these brushes are characterized by an exceptionally high nearly constant graft density approximately 0.4 chains/nm^2 and wide range of molecular weight of the graft chains (abstract). The presence of PMMA makes the density high and density of chains composing the polymer brush layer is 0.4 chains/nm^2 as taught by Yamamoto. Watanabe et al. discloses a hollow polymer particles obtained by emulsion polymerizing a crosslinkable polymerizable monomer composition and containing a crosslinkable monomer component and a hydrophilic monomer component (abstract). Example of hydrophilic monomer is N,N'-dimethylaminoethyl methacrylate (para 0057), which corresponds to the functional group such as aminoalkylene group and corresponds to formula 57, 59 of claim 9. Dumain discloses a low gloss powder coating composition comprising a glycidyl

containing acrylic polymer, a first acid functional crosslinking agent comprising a copolymer of an ethylenically unsaturated compound and an anhydride of a dicarboxylic acid and a second acid functional crosslinking agent comprising a dicarboxylic acid having 4 to 20 carbon atoms (abstract). Dumain discloses that the second acid functional crosslinking dicarboxylic acid includes sebacic acid, which corresponds to presently claimed formula 75.

21. The motivation of using the high density polymer brushes such as PMAA is to have strong resistance against compression with an extremely high graft density (conclusion, last 3 lines) and the motivation for having a functional group such as N,N'-dimethylaminoethyl methacrylate along with the crosslinkable monomer in the hollow particle is to form a hollow particle which is excellent in hardness, mechanical strength, heat resistance and solvent resistance and exhibit high coating property and shielding property (para 0024) and motivation of having a polyfunctional compound such as dicarboxylic acid such as sebacic acid in the coating composition to form a coating composition that exhibits excellent resistance to degradation and has low glass (para 0001) and results in increased durability (para 0016)

22. In light of the motivation of using the polymer brush layer with a density of chains of 0.4 chains/nm² as taught by Yamamoto and using the crosslinkable functional group such as 3-methyl-3-methacryloyloxy methyloxetane in the coating composition as taught by Maruyama as described above, it therefore

would have been obvious to one of ordinary skill in the art at the time of invention to use the polymer brush layer with such density, include benzyl methacrylate-PMMA, in Walt to have strong resistance against compression with an extremely high graft density and having a functional group such as N,N'-dimethylaminoethyl methacrylate along with the crosslinkable monomer of Watanabe in the hollow particle is to form a hollow particle which is excellent in hardness, mechanical strength, heat resistance and solvent resistance and exhibit high coating property and shielding property (para 0024) and including a first and second acid functional crosslinking agents such as methyl methacrylate and sebacic acid along with glycidyl containing acrylic polymer to increase durability and low gloss of the coating composition due to synergic effect of the first and second crosslinking agents (para 0016).

Response to Arguments

23. Applicant's arguments filed 02/23/2010 have been fully considered but, with the exception of arguments relating to Fu et al. ("Preparation of Cross-Linked Polystyrene Hollow Nanospheres via Surface- Initiated Atom Transfer Radical Polymerization"), they are not persuasive. Applicant argues that Walt does not disclose a polymer brush, so it does not disclose the polymer chains structure of polymer brush layer. However, Walt discloses a polymer which is a block copolymer of benzyl-methacrylate-PMMA, where the strength and durability of the polymeric shell is increased by crosslinking polymer chains (para 0011). Whereas, Yamamoto is used as teaching reference to teach that

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the polymer is high density polymer brush layer and by combining the high density polymer brush layer of Yamamoto with a block copolymer of benzyl-methacrylate-PMMA of Walt would result in the polymer chain composing the polymer brush layer with the structure as required by the applicant. It would have been obvious to one of ordinary skill in the art to use a polymer brush disclosed by Yamamoto in Walt where the resulting polymer brush comprises block copolymer of benzyl methacrylate-PMMA densely end grafted wherein the benzyl methacrylate is the crosslinkable monomer having a crosslinkable functional group located on the innermost portion of the polymer brush layer and the PMMA is the non-crosslinkable monomer.

24. Applicant argues that Yamamoto discloses polymer brush whose polymer chains are composed of homo monomer and these polymer chains are not even block copolymers. However, note that while Yamamoto do not disclose all the features of the present claimed invention, Yamamoto is used as teaching reference, and therefore, it is not necessary for this secondary reference to contain all the features of the presently claimed invention, *In re Nievelt*, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973), *In re Keller* 624 F.2d 413, 208 USPQ 871, 881 (CCPA 1981). Rather this reference teaches a certain concept, namely using a high density polymer brush layer and in combination with the primary reference, discloses the presently claimed invention.

Conclusion

25. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

26. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

27. Any inquiry concerning this communication or earlier communications from the examiner should be directed to RONAK PATEL whose telephone number is (571)270-1142. The examiner can normally be reached on Monday to Thursday 8 AM EST to 6PM EST.

28. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Callie Shosho can be reached on 571-272-1123. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

29. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

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Patent Examiner, Art Unit 1787

06/02/2010

/Callie E. Shosho/

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